

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2004/000984

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H01B 17/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 199, no. 710, 31 October 1997 (1997-10-31) & JP 9153315 A, (NGK INSULATORS LTD) 10 June 1997 (1997-06-10) abstract --	1,4,7,9-12, 17,19-21
A	US 4500745 A (MICHAEL R. MIGGINS), 19 February 1985 (19.02.1985), column 2, line 33 - column 4, line 13, figure 1 --	1-21
A	US 6088875 A (MAMORU ONO ET AL), 18 July 2000 (18.07.2000), column 3, line 9 - line 15, figure 1 --	1-21

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

12 October 2004

Date of mailing of the international search report

18-10-2004

Name and mailing address of the ISA/

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20010008330 A1 (TSUTOMU SAKATA), 19 July 2001 (19.07.2001), page 4, line 1 - line 62, figures 4, 5 -- -----	1-21

INTERNATIONAL SEARCH REPORT

Information on patent family members

03/09/2004

International application No.

PCT/SE 2004/000984

US 4500745 A 19/02/1985 NONE

US 6088875 A 18/07/2000 JP 10271643 A 09/10/1998

US 20010008330 A1 19/07/2001 JP 2001202838 A 27/07/2001
JP 2002160689 A 04/06/2002
US 6402155 B 11/06/2002

PATENT COOPERATION TREATY

PCT

REC'D 04 OCT 2005

WIPO

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 9559WO/HF	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/SE2004/000984	International filing date (day/month/year) 17.06.2004	Priority date (day/month/year) 11.07.2003
International Patent Classification (IPC) or national classification and IPC H01B 17/26		
Applicant ABB RESEARCH LTD. et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
 - a. ☒ (sent to the applicant and to the International Bureau) a total of 3 sheets, as follows:
 - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
 - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

<input checked="" type="checkbox"/>	Box No. I	Basis of the report
<input type="checkbox"/>	Box No. II	Priority
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input type="checkbox"/>	Box No. VI	Certain documents cited
<input type="checkbox"/>	Box No. VII	Certain defects in the international application
<input type="checkbox"/>	Box No. VIII	Certain observations on the international application

Date of submission of the demand 07.02.2005	Date of completion of this report 26.09.2005
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88 Form PCT/IPEA/409 (cover sheet) (April 2005)	Authorized officer Bengt Christensson/MP Telephone No. +46 8 782 25 00

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE2004/000984

Box No. I Basis of the report

1. With regard to the language, this report is based on:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____
which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b))
- ☐ publication of the international application (Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

- ☐ the international application as originally filed/furnished
- ☒ the description:
pages 1-10 _____ as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____
- ☒ the claims:
pages _____ as originally filed/furnished
pages* _____ as amended (together with any statement) under Article 19
pages* 11-13 received by this Authority on 19.06.2005
pages* _____ received by this Authority on _____
- ☒ the drawings:
pages 1-3 _____ as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-17</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-17</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-17</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The invention

The claimed invention concerns a bushing. The function of a bushing is to carry current through a barrier, such as a wall. A bushing comprises a central conductor surrounded by a dielectric medium. Furthermore, an insulating core built up around a central tube may be included.

Moisture may be absorbed into the core.

This invention is aimed to solve this problem. The solution is that at least a part of the insulating core comprises a diffusion barrier.

Cited documents

These documents are cited in the International Search Report. The citations are considered to describe the most relevant prior art:

D1) PATENT ABSTRACTS OF JAPAN vol. 199, no. 710, 31 October 1997 (1997-10-31) & JP 9153315 A, (NGK INSULATORS LTD) 10 June 1997 (1997-06-10) abstract

D2) US 4500745 A:

An insulating tube (3) is already known from D1. The tube (3) comprises a hollow core cylinder (1) and an outer covering (2). There is also a metallic seal part attached to an end part of the core cylinder (1).

.../...

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: BOX V

The object of this invention is to prevent infiltration of water and moisture.

A bushing according to the state of the art is described in D2. The bushing (10) comprises a conducting rod (20) and the rod is surrounded by a core (30). The core (30) is made up of sheets of metal foils (26) and paper (28) (fig. 1 & column 2, line 33-column 4, line 13). The paper sheets (28) are saturated with epoxy.

Analysis

Claim 1

D1 is cited in the International Search Report as a document of particular relevance and is now considered to show the closest background art. The reason for this review is that amended claim 1 of June 19, 2005, now describes that the insulating core comprises a diffusions barrier comprising a continuous film

These features are not revealed in D1. Consequently, D1 does not anticipate the technique of claim 1.

The bushing according to amended claim 1 is considered to give rise to an unexpected technical effect, i.e. the water or moisture is not absorbed by the insulating core in the bushing. Thus, this claim is not considered to describe a technique that is obvious to a person skilled in the art.

Claim 11

The independent and amended claim 11 reveals the same essential features as those according to claim 1.

Conclusion

In accordance with the arguments stated above, the invention in claims 1-17 is novel, considered to involve an inventive step and has industrial applicability.

CLAIMS

1. A bushing for an electrical device, comprising an insulating core (1, 7, 9), characterized in that at least a part of the insulating core (1, 7, 9) comprises a continuous diffusion barrier (2, 8) comprising a continuous film with firm adhesion to the insulating core (1, 7, 9).
2. A bushing according to claim 1, characterized in that the insulating core (1, 7, 9) is hollow and that at least part of the inside of the insulating core (1, 7, 9) is coated with the diffusion barrier (2, 8).
3. A bushing according to any of the preceding claims, characterized in that the insulating core (1, 7, 9) comprises a body of epoxy resin impregnated paper.
4. A bushing according to any of the preceding claims, characterized in that an outer hollow insulator (10) is arranged outside the insulating core (1, 7, 9), and that at least a part of the outer hollow insulator (10) is coated with the diffusion barrier (11, 12).
5. A bushing according to any of the preceding claims, characterized in that essentially the whole surface of the outer hollow insulator (10) is coated with the diffusion barrier (11, 12).
6. A bushing according to any of the preceding claims, characterized in that the diffusion barrier (2, 8, 11, 12) comprises at least one of the following; an inorganic film, an organic film or an organic/inorganic hybrid film.
7. A bushing according to any of the preceding claims, characterized in that the diffusion barrier (2, 8, 11, 12) comprises a multi-layer film.

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8. A bushing according to any of the preceding claims, characterized in that the diffusion barrier (2, 8, 11, 12) comprises particles of hybrid or inorganic nature.
- 5 9. A bushing according to any of the preceding claims, characterized in that the diffusion barrier (2, 8, 11, 12) has a coefficient of water permeability smaller than $0,1 \text{ g.m}^{-2}.\text{day}^{-1}$.
- 10 10. A bushing according to any of the preceding claims, characterized in that the diffusion barrier (2, 8, 11, 12) is deposited on at least part of the insulating core (1, 7, 9) and/or the outer hollow insulator (10) by one of the following methods; dipping, painting, spraying, plasma arc, sol-gel
15 technology, Physical Vapor Deposition (PVD) or Chemical Vapor Deposition (CVD).
- 20 11. A method for manufacturing a bushing for an electrical device, the bushing comprising an insulating core (1, 7, 9), characterized in coating at least a part of the insulating core (1, 7, 9) with a continuous diffusion barrier (2, 8) comprising a continuous film with firm adhesion to the insulating core (1, 7, 9).
- 25 12. A method according to claim 11, characterized in that the insulating core (1, 7, 9) is hollow, and in coating at least part of the inside of the insulating core (1, 7, 9) with the diffusion barrier (2, 8)
- 30 13. A method according to any of claims 11-12, characterized in arranging an outer hollow insulator (10) outside the insulating core (1, 7, 9), and coating at least a part of the outer hollow insulator (10) with the diffusion barrier (11, 12).
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14. A method according to any of claims 11-13, characterized in coating essentially the whole surface of the outer hollow insulator (10) with the diffusion barrier (11, 12).
- 5 15. A method according to any of claims 11-14, characterized in coating the insulating core (1, 7, 9) and/or the outer hollow insulator (10) with the diffusion barrier (2, 8, 11, 12) comprising at least one of the following; an inorganic film, an organic film or an organic/inorganic hybrid film.
- 10 16. A method according to any of claims 11-15, characterized in coating the insulating core (1, 7, 9) with a diffusion barrier (2, 8, 11, 12) comprising a multi-layer film.
- 15 17. A method according to any of claims 11-16, characterized in depositing the diffusion barrier (2, 8, 11, 12) on at least part of the insulating core (1, 7, 9) and/or the outer hollow insulator (10), by one of the following methods; painting, dipping, spraying, plasma arc, sol-gel technology, Physical
- 20 Vapor Deposition (PVD) or Chemical Vapor Deposition (CVD).